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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/704,212	10/31/2000	Wouter E. Roorda	M-9457 US	4669

7590 08/28/2002

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EXAMINER
MICHENER, JENNIFER KOLB

ART UNIT	PAPER NUMBER
1762	7

DATE MAILED: 08/28/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)
	09/704,212	ROORDA ET AL
	Examiner	Art Unit
	Jennifer Kolb Michener	1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2000* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-28* is/are pending in the application.

4a) Of the above claim(s) *23-28* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) *5* .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Examiner acknowledges with appreciation Applicant's election of Group I, claims 1-22, without traverse in paper #6.

Claim Objections

2. Claims 1, 17, and 19 are objected to because of the following informalities: the second line of step d) in claims 1 and 19 repeats the word "thereby" unnecessarily. In claim 17, line 1 is lacking a verb. Additionally, claim 17 recites "n-proponal". Based on page 16, line 3 of the specification, Examiner believes that Applicant intended to claim "n-propanol", especially in regard to claim 11 specifying the use of alcohols as the second solvent. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 12-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

These claims recite percentage ranges but fail to specify whether the ranges are in weight percent, mole percent, or volume percent.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1, 3, 5-11, 18-19, and 21-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Hsu et al. (4,871,357).

In regard to the independent claims, Hsu et al. teach coating a medical article with a non-thrombogenic heparin complex (abstract). Hsu teaches the use of his coating method on a porous hydrophobic polymer (col. 4, line 48 and preceding polymer list). The substrate polymers listed by Hsu, such as polytetrafluoroethylene, are inherently hydrophobic. And the coatings created by Hsu are useful on medical devices that come into contact with blood (col. 4, line 38) and are, thus, inherently hemocompatible. Hsu teaches dissolving the heparin complex in two solvents, such as trifluoro,chloro-ethane and ethanol, and dipping the medical device substrate therein. The trifluoro,chloro-ethane is a non-polar solvent, which will inherently wet the hydrophobic substrate polymer. The ethanol co-solvent is polar and, thus, inherently dissolves the heparin complex due to the numerous hydrophilic groups present on the heparin molecule. Ethanol's ability to dissolve heparin increases its solubility in the coating mixture.

In regard to claim 3, as outlined above, the medical device contacts blood.

In regard to claims 5-6 and 21, Hsu teaches a substrate material of polytetrafluoroethylene (PTFE), as outlined above, which is a fluoropolymer. Hsu teaches the use of the porous form of PTFE, otherwise known as "expanded" PTFE or "ePTFE".

The first solvent of Hsu, trifluoro,chloro-ethane is a fluoropolymer-wetting alkane, as required by claim 7.

In regard to claims 8-10 and 22, the heparin complex of Hsu contains a hydrophobic counter-ion (see figure in Abstract and throughout). While Hsu discusses the disadvantages of this particular counter-ion, benzylalkonium ion, the reference does disclose its use (col. 4, line 16).

The second solvent of Hsu is ethanol, as outlined above. This is an "organic alcohol" as required by claim 11.

The medical article of Hsu may be coated by dip coating (col. 3, line 43), as required by claim 18.

7. Claims 1, 5-7, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Drumheller (5,914,182).

Drumheller teaches coating porous hydrophobic expanded/porous polytetrafluoroethylene (abstract; col. 5, line 50; col. 12, line 5) with polyvinyl alcohol (PVA). among others (col. 12, line 48). PVA is inherently hemocompatible as required by Applicant. Drumheller teaches pre-wetting the substrate with a miscible solvent (col. 13, line 7) followed by dipping the substrate in a solution of the PVA in a solvent of methanol, ethanol, or THF, among others (col.12, lines 35-67). The first wetting solvent wets the solvent and is miscible with the second solvent which dissolves the PVA, as required by Applicant.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 2, 4, 12-15, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu et al.

Hsu teaches that which is disclosed above, but fails to teach the relative concentration of the solvents used in the method of his invention. It is the Examiner's position that selection of appropriate relative concentrations of the wetting solvent and dissolving solvent would be determined by one of ordinary skill in the art based on the substrate to be wetted and the compound to be dissolved. It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause

effective variable such as this through routine experimentation in the absence of a showing of criticality in the claimed variable. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990). Particularly, selection of a concentration at which two compounds form an azeotrope is useful in the coating industry to provide uniform deposition of the coating material and, since azeotropes evaporate at the same rate, the solvents can be economically reused and recycled because they maintain their same concentration during evaporation.

Hsu teaches that the method of his invention is useful in coating medical prostheses that contact blood, such as catheters and artificial blood vessels that are frequently fabricated from PVA, polyurethane, and polytetrafluoroethylene, among others. Further, Hsu states that his method may be used for treating metal prosthetics with a polymer coating of the above listed polymers (col. 4, line 39 and line 51). It is the Examiner's position that the broad category of "artificial blood vessels" and the like which are fabricated from metal and coated with PTFE is inclusive of stents. Stents are typically made of stainless steel or Nitinol and commonly coated with ePTFE. Stents function in blood vessels as support structures. It would therefore have been obvious to one of ordinary skill in the art to select stents from among the broad class of blood-contacting metal medical prostheses coated with PTFE with the expectation of successful results using the treatment method of Hsu.

10. Claims 1-3, 5, 7-15, 17-19, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eriksson et al. (4,118,485) in view of van Tassel et al. (6,241,710). Eriksson et al. teach rendering a medical article non-thrombogenic by coating with a heparin solution (abstract). Heparin is inherently hemocompatible. In the examples, Eriksson teaches the use of polyethylene catheters as the substrate. Polyethylene is hydrophobic. In example 2, Eriksson teaches the use of a first and second solvent, namely cyclohexane and ethanol. Cyclohexane is non-polar and would inherently wet the surface of a hydrophobic substrate, while ethanol is polar and would inherently dissolve the heparin due to heparin's numerous hydrophilic groups. Eriksson then contacts the catheters with said solution by dipping and then the solvent is evaporated leaving heparin on the catheters.

What Eriksson fails to teach is whether the polyethylene catheters are porous. First, Examiner notes that polyethylene may be porous and that it would have been obvious to one of ordinary skill in the art to select porous polyethylene from the class of "polyethylene" taught by Eriksson which would include porous and non-porous polyethylene.

However, Examiner further cites vanTassel et al. (6,241,710) for teaching that catheters may be made from porous polyethylene (col. 8, lines 5-6).

Since Eriksson teaches the use of polyethylene in catheters and vanTassel teaches that such polyethylene used in catheters is of a porous nature, then vanTassel would have reasonably suggested to one of ordinary skill in the art the use of porous polyethylene in the method of Eriksson with the expectation of successful results.

In regards to claim 2 requiring that the "second solvent is dissolved in said first solvent in such a quantity as to form an azeotropic mixture", Examiner notes that the concentration of ethanol (the "second" dissolving solvent) in the mixture of cyclohexane and ethanol is azeotropic at 44.5 mole percent or 71% by weight (Source: Chemical Engineering Handbook and U.S. Pat. 5,147,586). From Examiner's own calculations, the final mixture of example 2 of Eriksson forms a mixture of 49.6 mole percent ethanol or 64 percent by weight ethanol.

While the mole and weight percentages of Eriksson, lie just above the azeotropic concentration of the two solvents, Examiner notes that ethanol is slowly added to the cyclohexane. Therefore, at some point just prior to the final amount of 64 ml of ethanol added to the 120 ml of cyclohexane, the azeotropic concentration of the mixture is reached, if only momentarily.

Likewise, in regards to claims 12-15 and 17 requiring 0.00001%, 0.1%-10%, 0.1%-2%, 0.5%-1%, and 5% of the second solvent, Examiner also notes that at some point the second solvent is dissolved in the first at the above concentrations.

Additionally, it is Examiner's position that selection of appropriate relative concentrations of the wetting solvent and dissolving solvent would be determined by one of ordinary skill in the art for those reasons outlined above regarding the Hsu reference.

Regarding claim 7, cyclohexane is a fluoropolymer-wetting cycloalkane.

Regarding claims 8-10, Eriksson teaches the use of benzylalkonium ion as the hydrophobic, quaternary ammonium heparin counter-ion (Examples and throughout).

The ethanol, which is used as the second solvent, is an alcohol, as required by claim 11.

In regard to claim 17, Eriksson teaches that the non-polar solvent such as cyclohexane can be mixed with a polar lower alcohol, such as either ethanol or propanol. The heparin complex first forms an emulsion in the non-polar first solvent, but becomes dissolved as the polar, second solvent is added (col. 5, lines 5-20), as is required by Applicant's claims.

The substrates are dipped, as required by claim 18.

11. Claims 1, 3-6, and 18-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hossainy et al. (WO 01/45763) in view of Patnaik et al. (6,338,904). Hossainy teaches a method of coating a stent with ethylene vinyl alcohol (EVAl) copolymer and a therapeutic substance in dimethylsulfoxide solvent and a wetting solvent (abstract; page 4, lines 5-6, 12, and 20; page 5, line 6). The use of the EVAl and therapeutic substance on a stent, which is used while contacting blood, make them inherently hemocompatible. The dimethylsulfoxide acts to dissolve the solutes and the wetting agent wets the stent substrate, as is indicated by its name.

While Hossainy teaches coating stents with the method of his invention, he fails to specify the make-up of the stent itself. It is known in the art that stents may be manufactured of metal or plastic, with the plastic stents being more useful in small-diameter applications. Examiner cites Patnaik to teach that stents and other vascular prosthetics may be made of polymers, such as expanded polytetrafluoroethylene (paragraph bridging columns 8 and 9). The stents of Patnaik are subsequently coated with bioactive agents.

Since Hossainy teaches a method of coating stents with bioactive agents and Patnaik teaches that porous, hydrophobic polymers such as ePTFE are used as stent material and may be subsequently coated with bioactive agents, Patnaik would have reasonably suggested the use of polymer stents in the coating method of Hossainy. It would have been obvious to one of ordinary skill in the art to use the teachings of Patnaik in the method of Hossainy with the expectation of successful results.

The stent may be immersed in the solution, as is required by claim 18 (page 5, line 21).

Conclusion

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Lewis et al. (5,993,489) and Bley et al. (5,674,241) are cited to show that metal stents coated with ePTFE are well-known blood-contacting blood vessel prosthetics.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer Kolb Michener whose telephone number is 703-306-5462. The examiner can normally be reached on Monday through Thursday and alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on 703-308-2333. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer Kolb Michener
August 26, 2002

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